

not read the book with admiration. Like all Mr. Lewes' works, it is a repertory of suggestive fact and of equally valuable and suggestive thought; and if any reader derive from its perusal a tithe of the intellectual stimulation it has afforded me, he may regard his time as well spent. Reflective minds are diligently working towards clearer conceptions in a region that has hitherto been all obscurity. There is reason to believe that ere long philosophic thinkers of the highest rank will for the first time agree as to one or two fundamental conceptions. Few living men have done as much as Mr. Lewes to usher in this new era. Knowing my criticisms to be inspired solely by the same impersonal motives by which he has himself been sustained throughout his extensive labours, I am sure Mr. Lewes would be the last person to suggest that I could have made better use of the space at my disposal. Others, better qualified than myself, will draw attention to the importance of those parts of the work that I have not mentioned, as, for instance, the splendid essay on the Nervous Mechanism.

DOUGLAS A. SPALDING

### GORE'S "ELECTRO-METALLURGY"

*The Art of Electro-Metallurgy; including all known Processes of Electro-deposition.* By G. Gore, LL.D., F.R.S. Text-books of Science Series. (London: Longmans, Green, and Co., 1877.)

DR. GORE has evidently spared no pains to make this text-book a complete manual of the art of electro-metallurgy. Beginning with the history of the subject, he gives an interesting account of the rise and development of the art, full of names and dates and references, and makes the early inventors tell, as far as may be, their own story by quoting freely from their published papers. Then comes a "theoretical division," about which we have something to say presently, and this is followed by what forms the greater part of the work—a detailed account of practical methods of depositing the various metals. This portion of the book, at once thoroughly circumstantial and comprehensive, cannot fail to prove most useful to the practical electroplater as well as to the scientific student. The metals most commonly employed in the arts receive, of course, most attention; but almost none, even of the rarest metals, pass without notice, and the experiments are described with the precision that comes only of experience. An admirable feature of Dr. Gore's book is the habit he has of giving specific references to the authorities he makes use of, so that any one with a library at his command may, if he choose, turn up the passages cited. The remainder of the book is filled by a "special technical section" containing various practical directions and details, and, in conclusion, we have a list of the books previously published on the subject and of the English patents referring to electro-metallurgy. The author is to be congratulated on the accumulation and systematic arrangement of an immense mass of information of a kind that will be welcomed alike in the workshop and in the laboratory.

If Dr. Gore had given us only the practical parts of his book we should have had little to say beyond praise and thanks. Unluckily, however, for himself as well as for

his readers, he has introduced a chapter on the theoretical principles which underlie the art of electro-deposition. Such theoretical *réchauffés* are often to be found in practical text-books, but their existence is surely a thing to be protested against even when they are tolerably well written. No one can hope to give a satisfactory account of chemical and electrical theory in fifty pages, and when his work is to form one of a series in which chemistry and electricity have already been treated of in separate books, the attempt is not only useless but unnecessary. These short abstracts are certainly not to be recommended to the novice; and to the student who has already studied the subjects at greater length they are little short of an impertinence. In a book which stands by itself they might be tolerated if they were at once concise and accurate, giving what is needed and no more. In the case before us these extenuating circumstances are all absent. That Dr. Gore's "theoretical division" is not concise the following quotation will suffice to show:—

"The strength of the current is equal to the electromotive force divided by the resistance; this is known as Ohm's law; it is directly proportional to the electromotive force, and inversely proportional to the resistance; if the resistance remains the same, and the electromotive force varies, the strength is directly proportional to the electromotive force; and if the electromotive force remains the same, and the resistance varies, it is inversely proportional to the whole of the resistance in the circuit" (p. 71).

As an instance of matter which might very well have been left out, take the following. After giving a table of conductivities, Dr. Gore proceeds:—

"If the conduction-resistance of distilled water is so great in relation to that of copper, we can easily understand, by referring to the previous table, that the resistance of gases must be enormous. The electric conduction-resistance of air heated to redness (*sic*) is 30,000 greater than that of water, containing a 20,000th part of its weight of sulphate of copper in solution" (p. 31).

Why this long-buried result of E. Becquerel's (here, by the way, the authority is not cited) should be unearthed for the benefit of students of electro-metallurgy is almost as puzzling as is the strange piece of *à priori* reasoning in the first sentence, which, it is distressing to find, we are expected to understand easily.

The vagueness and inaccuracy of some parts beggar criticism, and leave the reviewer but one weapon—a severe one indeed, but he has no other—he can only quote. Here are a few specimens chosen almost at random.

"The fundamental act or principle of magneto-electric action is, *wherever there is varying magnetism, there is an electric current induced in an adjacent closed circuit at right angles to it*" (p. 57); the italics are the author's.

"The electromotive force, or strength of the current to overcome resistance, depends upon the degree of difference of strength of chemical affinity of the two metals for the electro-negative constituents of the liquid" (p. 70).

"The electromotive force (commonly called 'the intensity') of the current . . ." (p. 337).

"As the electromotive force is diminished by resistance, a diminution of resistance in any part of the circuit will increase it" (p. 337); this extract we have ventured to italicise.

"Motion of the articles is very advantageous . . . it

greatly diminishes the electric conduction-resistance which would be produced by polarisation, due to layers of liquid of opposite electrical nature, collecting in contact with the electrodes" (p. 344).

"*Potential and tension.*—Previous to the completion of the circuit and formation of an unimpeded current, the free ends of the polar wires attached to the two metals are charged with the two kinds of electricity in an accumulated or free static condition, and are in a state of *electric potential*, i.e., possessing a capability of doing electric work. These accumulated electricities in the wires may be detected by means of a very delicate electroscope. The free electricities are also in a state of *tension*, constantly tending to escape and unite; and their degrees of tension may be measured by means of an electrometer" (p. 71).

From which it would appear that the difference between potential and tension lies in the fact that the one is to be detected by an electroscope, and the other measured by an electrometer. It would be just as satisfactory a distinction, and would besides have the merit of being true, to say that "potential" is the shibboleth of the electrically unlearned, while "tension" is their refuge at all times.

Over and over again we find such phrases as these:—"If the current to be measured is one of low electromotive force" (p. 73); "a current of less quantity and greater electromotive force" (p. 338); and after we have been expressly told on p. 72 that there is no difference between currents except as regards their quantity per minute, it is surprising to learn that "as a general rule, the greater the electromotive force, and the smaller the quantity of the current, the harder and brighter is the deposited metal" (p. 344).

But it is needless to multiply examples. We have given enough to show how much Dr. Gore has done to mar a really good book by adopting a precedent which, however well followed, is of very doubtful utility. In the present instance it may, perhaps, serve the good purpose of acting as a warning to future practical writers.

We have noticed comparatively few typographical errors. Is it the author, or the printer, or the author's evil genius, or the printer's devil that we have to thank for this bewildering statement on p. 182?—

"Silver may be cleaned in water in which potatoes have been boiled, and a superior polish is thus imparted to them."

#### OUR BOOK SHELF

*Enumeracion de las Plantas Europeas que se hallan como silvestres en la Provincia de Buenos Aires y en Patagonia.* Por Carlos Berg. (Buenos Aires, 1877.)

THIS is a very interesting list of European plants introduced by various means into the two above-mentioned countries. It gives the relative abundance of each species and the conditions under which it is found. Altogether 116 Dicotyledons, 30 Monocotyledons, and 8 Cryptogams are mentioned. Of these no less than 108 are common to Britain. As might be expected, the natural orders Compositæ and Gramineæ, each with 20 species, and Caryophyllæ with 12, are the strongest in point of number of species. Many notes are scattered through the twenty-four pages, from which we learn that under such extremely different conditions some of our British plants attain extraordinary dimensions.

#### LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

#### Optical Spectroscopy of the Red End of the Solar Spectrum

BEING NOW, with my wife, on the return voyage from a private spectroscopic experiment on solar light in Lisbon, there appear to be two or three reasons why I should request your leave to send this preliminary note to NATURE before attempting to publish anywhere a full account of what was seen.

As the *first* of these reasons, I may mention that the continual assistance kindly afforded us by M. Oom, the Astronomer-Royal of Portugal, and the several facilities obligingly granted to us, through his intervention, by the Portuguese Government, render an early and hearty acknowledgment imperative. All the more so, too, as the last and most successful series of observations, through four successive days of blazing sunshine, without the smallest speck or suspicion of a cloud anywhere from morning to evening each day, was made in a new suite of rooms recently prepared for the local astronomer's residence in the Royal Park of the Ajuda.

The *second* reason is the pleasing one to confess, that out of four prismatic arrangements tried in the same spectroscope—the one which had the highest dispersion (viz., 32° from A to H) gave also the best and most satisfactory definition, showing thereby such wondrously fine and minute detail amongst close lines as to cause it to be almost invariably employed, and that prismatic arrangement, I am happy to say, was lately made for me by Mr. Adam Hilger, of 192, Tottenham Court Road, London, on his own long-approved plan of three powerful and symmetrical compound prisms, while the eye-piece of the telescope, also by him, was of rock-crystal, and fitted with his peculiar reference line for micrometer mensuration.

The *third* reason is the total contradiction given by the best of these observations to some conspicuous features of the Royal Society's last publication on the red end of the solar spectrum, when seen at a high altitude with their second and most improved "Indian Spectroscope."

Our late Lisbon measures, though made at a station close to the sea-level, were yet, near the noon of each day there, and on a midsummer sun in that latitude, taken through almost the very same thickness of atmosphere, as the Royal Society's, and Mr. Hennessey's high-sun series on the Himalaya Mountains. But those Indian observations having been printed in the *Philosophical Transactions* so long ago as 1874, I should be glad to know whether either the Royal Society or anyone else has published further particulars of the extreme red end of the solar optical spectrum since then. PIAZZI SMYTH,

Astronomer-Royal for Scotland

#### The Cretaceous Flora of America

NEAR the close of his very interesting lecture "On the Tropical Forests of Hampshire," published in NATURE (vol. xv. pp. 229, 258, 279) Mr. J. S. Gardner says:—"I have great doubts, however, as to the correct position of many of the foreign so-called cretaceous beds. Those of America, from which most of the list of dicotyledons of this period is derived, appear to me, from the character of their fauna, to be rather lower eocene, or at most, filling in the gap between our chalk and London clay. Most of the shells have a marvellously eocene-like aspect, and I take it that the presence of an ammonite, and some few other forms of shells which in England do not reach above the chalk, should not be taken as conclusive evidence of the antiquity of the bed, as, although migrated from our seas, they may very well have lived on in other regions. It is inconsistent to assume that no ammonite lived on in any part of the world to a more recent period than that of our chalk."

From these remarks it is evident that Mr. Gardner is not fully informed in regard to the evidence which exists on the question he has raised; and as the subject is one of great interest, and one which it is necessary should be carefully understood by those